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Cool Roofs
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Cool Roofs

In the building of a house for Habitat for Humanity, one of the goals is to provide an energy efficient house so as to help cut costs for the home owner. Now in doing this, every part of the house can be scrutinized for improvements, and the roof is no different. A roof, apart from keeping the elements out of a home, serves a very important role in keeping the inside of a house at a constant temperature, and does so in a couple of ways.

The first of these is acting like an insulator. Like a wall, a well insulated ceiling will keep the hot temperatures out during the summer and the warmth in during the winter. Helping to account for this in building an energy saving house is relatively simple. Just like sheetrock and insulation in walls, or plywood that is put on roofs, roofing materials come with something called an R value. The basic idea with R values is that generally the higher the number, the less energy the material can transmit over a certain amount of time. In other words it means that on a hot day it will take longer for a house to heat up (or to cool down in cold weather), which leads to less strain on the air conditioning/heating unit, which saves money. However do not rely on this number alone for there are factors that outweigh this one in importance.

The second, and probably more important aspect of roofing, would be both the solar reflectance and thermal emittance. Solar reflectance, or SR for short, is designated by a number between 0 and 1 and refers to the amount of energy (such as visible light, infrared light, and UV light) from the sun that the material reflects. In other words, the higher the number, the less energy the material will absorb and transfer to the house, meaning the house will heat up less and thus cut cooling costs. Thermal emittance (TE), which is also a number from 0 to 1, is a material's ability to emit heat back to the environment. In other words, a material when heated to a higher temperature due to energy from the sun, will radiate more of that heat back to the environment than to the house if it has a higher TE. It should also be mentioned at this time that sometimes both the SR and TE values will be rolled together into one value called the Solar Reflectance Index, or SRI for short. The SRI is represented by a number between 0 and 100, albeit it is possible to find values below 0 and above 100 due to how it has been scaled, though these numbers are rare. Also, like the TE and SR values, the higher the value, the more energy efficient the roof will be. It should also be noted that these numbers are what is considered when determining if a roof is a cool roof. And cool roof is a term used by such groups as the Department of Energy (DOE), Energy Star, LEED, and the Cool Roof Rating Council (CRRRC).

Now while it is easy to say that a higher R value, SR, and TE rating will yield savings, it is much harder to put a quantifiable number to those savings. With variables such as roof pitch, inside temperature, outside temperature, coefficient of performance of the air conditioning and heating unit, and the cost of fuel or electricity it is very hard to come up with concrete savings. However there are several savings calculators that can be found online. These calculators are fairly simple to use and should give at least a rough savings. For example, using the DOE Cool Roof Calculator and assuming average values for certain variables an estimation of savings can be calculated, as can be seen in the appendix. Now, these savings are not truly what the home owner for a

Habitat for Humanity will save due to the fact that the DOE calculator uses flat roofs and HFH home use a pitched roof.

So to sum up and to add a few final notes on, here are a few things to look for and to keep in mind when looking at roofing numbers.

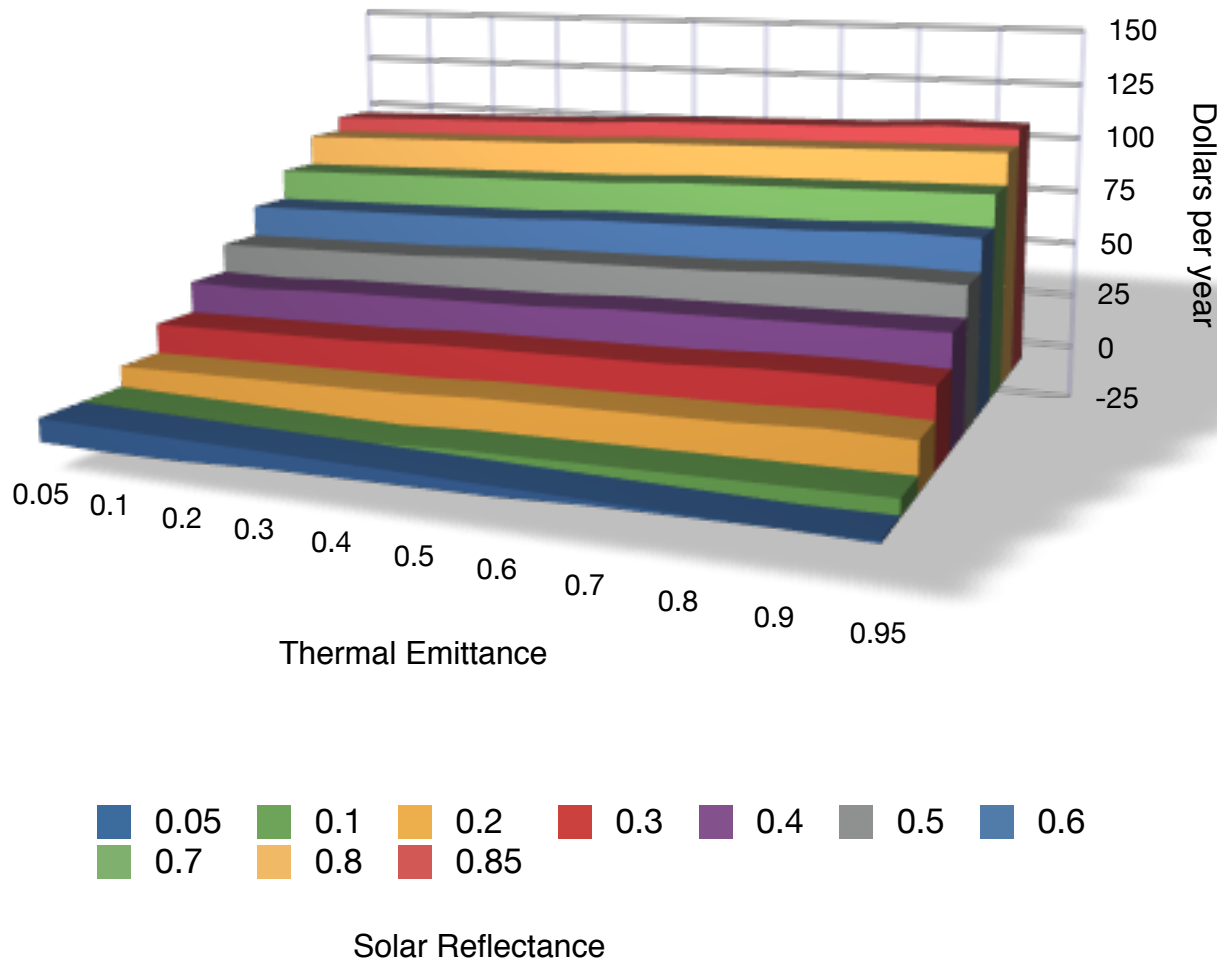
- 1.) The higher the solar reflectance value, the more the homeowner will save. This value will yield the best savings
- 2.) The higher the thermal emittance value, the more the homeowner will save.
- 3.) the R-value is important, however, check with the energy calculators before choosing an R-value for the roof as higher SR and TE values might actually save more money with a lower R-value.

As for the question of what type of roofing material to use, that is a little bit of a harder question to answer. The two most common types of roofing materials used, and therefore the most available would be asphalt shingles and metal, both of which have their pros and cons. First of all, both types can be found with high SR and TE values, albeit metal roofing, due to the fact that they are usually coated, usually have an easier time achieving higher values. As for life expectancy of the roof, metal will be better as they can easily have at least a twenty year life expectancy as opposed to asphalt roofs which do well if they last ten years. However when it comes to installation, the asphalt roofs will be more volunteer friendly if the roof has any changes in the roof's surface. However, if you are using a team of professionals then it only depends on what the teams charge. As for price, since metal roofs last much longer than asphalt roofs, a good ratio to remember when comparing the two, when they have fairly equal SR and TE values is 3:1. If the metal roof costs up to three times that of an asphalt roof it should be cheaper in the long run. However I would still suggest checking on the life expectancies of whatever roofing material you would decide to look at. Also, what should also be taken into account is the fact that Habitat for Humanity homes receive items at a discount or for free, so these offers must be considered on an individual basis.

So in conclusion when dealing with roofing materials, it is hard to give any definitive answer regarding what to get due to all the variables. Therefore only guidelines can be given. To save the homeowner more money find roofing material with higher solar reflectance and thermal emittance values. However remember that the higher the values, the more the roofing will cost, so don't go overboard trying to find the highest SR and TE values. To save overall roof costs remember that metal roofs last at least twice, if not three, four or more times longer than asphalt roofs, so do not be afraid to spend more for a metal roof. Following these basic guidelines should save money in the long run.

Appendix

Annual savings with different Thermal emittances and Solar Reflecta



Bibliography

Cool Roof Rating Council. 2011. 8 December 2011 <<http://www.coolroofs.org/index.html>>.

DOE Cool Roof Calculator. 8 December 2011 <<http://www.ornl.gov/sci/roofs+walls/facts/CoolCalcEnergy.htm>>.